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SOME ECONOMIC ASPECTS OF FARM OWNERSHIP

Trends and variations in Some Financial Burdens and Benefits of Farm Ownership in the Spring-Wheat Belt During 25 Years. Illustrated from the History of Selected Farms in Cass County, N. Dak., 1896–1920

By CHARLES L. STEWART, *Agricultural Economist, Bureau of Agricultural Economics*

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Records of cost and income[1] in using land over periods reaching back to the nineties or before should be of special value to those who own or consider buying farms, particularly those buyers who must carry the cost and pay out the purchase price from income derived currently from the use of land. Such persons need to figure largely in terms of a full life span or generation. This is true despite the fact that costs and incomes in land utilization are subject to ebb and flow above and below the trends which they take in the life span of an owner, and despite the further fact that both the trends and deviations may differ in the next 20 or 30 years from those of the past generation.

The factors affecting the economic position of landowners need special study in their shifts and changes during a period in which money was generally losing power to purchase commodities and real estate; in a period, in other words, in which prices were moving from the valleys of the nineties to the peaks of the later teens. The peculiarities of this quarter century should be understood by one who would take a clear view either of the succeeding quarter century or of the more immediate parts of it.

[1] In 1919 the Division of Farm Population and Rural Life, in charge of C. J. Galpin, instituted a study of the social aspects of farm tenancy in the community of Amenia, N. Dak., with Walter H. Baumgartel as field investigator. Many of the economic data used here were first located in this way. The study was continued and summarized in this report in the Division of Land Economics in charge of L. C. Gray.

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PURPOSE AND SCOPE OF INQUIRY

In the material supplied by the owners of farms included in this study[2] comparable figures are found that cover over four decades in the case of land valuations and, in the case of other items, periods ranging from four years to nearly three decades.

Company records included 68 farms, one of which is missing in the transcription made by department workers. In the case of two of these farms there were short gaps in records otherwise consistent. The records for 49 farms run to 1919, and for the 16 farms that are the special subject of this study, to 1920. The average number of years covered in the records of the 49 farms is 15, all but 12 of the records extending from 15 to 18 years. The average number of years covered in the records of the 16 farms is 27, and though there was some shortage in the number of these farms during the first six years, there was no shortage in the area included in them. Of the 1,162 years of farm record, nearly 64 per cent is included in the records for the 49 farms. The records for the 16 farms include 417 farm years, of which 398 are used in this study. The almost perfect consistency of the records for the 16 farms, the greater length of time covered by them, and the fact that they show no significant differences justifying further comparisons with the records of the other farms account for the basing of this study entirely on the 16 farms.

From the standpoint of variability in the rents per acre from year to year it would be desirable to limit the number of farms to a smaller number than 16. The massing of even so few farms as 16 tends to make the variability seem less than that which would have been experienced by a person owning fewer farms. It was considered that the statistical advantages and disadvantages resulting from either a large or a small number of cases, where annual variations in averages per acre are involved, were near their minimum when the study was based on the 16 farms covered for the longest period. Moreover, one of the important objectives of the study is to analyze the relationship between various economic factors and the valuation of the farms, and a study of this kind is no less feasible when made for a comparatively small number of farms.

The accuracy of these records can not be questioned, and "error of observation" can be regarded as at a minimum.

The basic figures applicable to these 16 farms, supported as they are by data from a half hundred other farms in the same locality, are not necessarily representative of the entire Lake Agassiz basin or of any other considerable area of the spring-wheat belt. Nevertheless the trends in these figures and the indicated variations are probably similar to those which have been experienced in connection with large numbers of farms in that general area. The types of relationship among the trends and variations, as shown here, are probably not peculiar to the farms belonging to a single corporate landlord, but may be considered to indicate fairly the major shifts in the economic position of many wheat growers in the Northwest.

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[2] The cooperation of Walter R. Reed, for many years president of the Amenia-Sharon Land Co., and an official of allied corporations, made the present study possible by much personal and official assistance.

LONG-TIME AVERAGE CONDITIONS OF OWNERSHIP

An agriculture that is subject to the risks of variability in the manner indicated in this study is an agriculture deserving detailed economic treatment. The present partial study of some conditions of land ownership and valuation is but one of a series of similar studies needed not only in the wheat regions but wherever the figures are available for any extended periods, by cooperation with landowners or otherwise. The interplay of factors influencing farm real-estate valuations, as analyzed in this study, is not to be regarded as altogether peculiar to these farms. On the contrary, it is probable that similar analysis would be widely feasible and equally significant.

VALUATIONS OF LAND AND BUILDINGS

In Table 1 the average valuation per acre of the real estate in these farms at census dates is compared with that in all farms in Cass County, the State of North Dakota, and the United States as a whole.

TABLE 1.—*Farm real-estate valuations per acre*

Census	Selected farms [1]	Cass County [2]	North Dakota [2]	United States [2]
1920	$110.00	$86.20	$41.10	$69.41
1910	53.00	46.64	28.94	39.60
1900	22.50	23.49	12.79	19.81
1890	18.00	15.14	9.83	21.31
1880	10.00	12.42	8.34	19.02

[1] Based on actual transfer prices of real estate of similar quality and state of improvement in years specified.
[2] Based on United States census reports.

These farms exceeded in average valuation per acre the farms of the county at the three census dates 1890, 1910, and 1920, the State at each census date and the United States in 1900 and after.

In Table 2 it is possible to show the census valuation of buildings only for the last three census dates. The valuation of buildings on the selected farms was estimated by the owners.

TABLE 2.—*Valuation of buildings per acre and percentage of total real-estate valuation represented by buildings*

Year	Valuation of buildings per acre				Percentage valuation of buildings is of valuation of total farm real estate			
	Selected farms [1]	Cass County [2]	North Dakota [2]	United States [2]	Selected farms	Cass County	North Dakota	United States
1920	$7.02	$10.58	$5.78	$12.02	6.4	12.3	14.7	17.4
1910	3.80	5.46	3.25	7.20	7.2	11.7	11.2	18.1
1900	1.88	2.62	1.64	4.24	8.4	11.2	12.8	21.4

[1] Exclusive of buildings owned by tenants, including a garage in each of the five instances in which tenants owned buildings on these farms. The valuations shown for 1920 were figured by the rule of a fire-insurance adjustment company and on a basis of depreciation stated by them to be conservative. In choosing between "sound" and "replacement" valuations (the former being 70 per cent of the latter), replacement figures were selected as more comparable with the census data.
[2] Based on United States census reports.

The percentage valuations of buildings per acre were less in the case of the selected farms than in the case of county, State, and National averages. It may be assumed, therefore, that the proportion of real-estate valuations that was in land rather than in buildings was higher in the case of the selected farms. In the case of farms in the county, State, and Nation, the rate of increase of the land valuations was less than that of the valuations of buildings. In the selected farms, however, the rate of increase of the valuation of buildings was less than that of the land.

Although the selected farms had a smaller investment in buildings per acre relative to the land valuation, the investment per farm was larger than that of the average farm of the State and Nation. In 1920 the average valuation of buildings per farm was $4,212 in the case of the selected farms, $2,693 in North Dakota, and $1,781 in the United States. In Cass County, however, the 1920 census showed an average farm to have buildings worth $4,456, or $244 more than the valuation shown here for the selected farms.

GROSS v. NET RENTS

To distinguish between the gross benefits and the net benefits that accrued to these owners it is necessary to separate the gains due to appreciation of property valuation from the income derived from rents.[3] Both types of gains will be expressed in annual terms, although often thought of best in terms of rotation periods or longer spans of time. To make the distinction between gross rent and increment and net rent and increment, the burdens and costs chargeable to each source of gain, so far as permitted by the data, will be distinguished and apportioned.

The contracts used on the selected farms were uniform and unchanged, except in minor respects,[4] throughout the period since bonanza farming was replaced by tenancy in 1893. Tenants were not restricted from keeping livestock on their own account, but neither the natural increase nor the products were shared with the landowners. Crops having an aggregate value of $2,246,686 were divided between tenants and landowners, the half-share basis being applied, with minor exceptions, to all crops raised, and being modified only in years of smallest yield. According to Table 3, less than 2 per cent of the aggregate of tenants' credits on the landowners' books took the form of pasture rent paid in cash and of miscellaneous items. The balance resulted from delivery of crop shares.

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[3] The term "rent" as employed here is not to be confused with "economic rent of land." Used here it comprises returns for use of the farm buildings, including tenant houses, as well as for use of the land. It is an annual return reduced to terms of money, except where otherwise indicated, and is over and above all costs borne by the owners, including among costs supervision and general expense. No taxes are deducted except when so indicated, and then only real-estate taxes, these including road taxes when not otherwise stated.

[4] The owners relieved the tenants of paying road taxes after 1913. Between 1896 and 1913 these taxes had aggregated $3,829, or about 2 cents an acre per year.

TABLE 3.—*Summary of rent items, selected farms, Cass County, N. Dak., 1896–1920*

[Totals for 25 years as shown on landowners' books]

DEBITS TO TENANTS' ACCOUNTS			CREDITS TO TENANTS' ACCOUNTS		
Overhead		$215,466	Crops delivered		$1,070,059
Supervision and general expense	$147,885		Wheat	$713,463	
Repairs	66,079		Barley	102,527	
Insurance	1,502		Flax	101,902	
Other debits		372,869	Oats	95,423	
Seed	253,171		Corn	34,910	
Plowing	54,680		Hay	10,906	
Threshing	54,141		Rye	10,928	
Summer fallowing	5,650		Other credits		17,386
Miscellaneous	5,227		Pasture rent	5,047	
			Miscellaneous	12,339	
Total		588,335	Total		1,087,445
Primary net rents (tenants' credit balance)					$499,110
Real-estate and road taxes					64,169
Secondary net rents					434,941
Acre-years[1]					237,440
Net rents per acre-year:					
Primary					$2.10
Secondary					1.90

[1] The acreage of the 16 selected farms was 9,600 during the period 1900–1920. Of this area, 9,280 acres were in farms included in 1898–99, and 8,640 in farms included in 1896–97.

It is worth noting, however, that although this land was rented on a basis affording the owners an apparent gross return of 50 per cent of the crop values, the ratio of net rent to the value of divided crops was 23 per cent when computed without deduction of taxes and but a little more than 20 per cent when full deduction is made for all real-estate and road tax paid on this land. If account is taken of crops which the tenants were excused from sharing in drought years and of products raised without obligation at any time to share them, it is safe to say that less than a fifth of the gross production of the farms came to the landowners as primary net rent, and little more than a sixth can be attributed to this land as secondary net rent.

The difference between primary net rent and secondary net rent is the full amount of real-estate and road taxes, regardless of whether paid in either the first or the last instance by owners or by tenants. Over the 25 years it appears that the amount of real-estate and road taxes was 25 cents an acre in an average year. As a consequence of these taxes, secondary net rents were one-eighth less than primary net rents.

GROSS v. NET INCREMENTS

The valuation of this farm real estate in 1896 was $18.50 per acre, and probably 10 to 12 per cent of this was in buildings. In 1920, however, the valuation of farm real estate per acre was $110, of which between 6 and 7 per cent represented buildings. About $6 per acre of the increment in realty valuation was in buildings. This, of course, is only a portion, though possibly the major portion, of the investment made by the owners in building equipment on these farms between 1896 and 1920.[5] For lack of any other definite figure on the

[5] Although appreciation may have exceeded depreciation during a few years preceding 1920, the reverse was doubtless true during the greater part of the 25-year period. The owners should not be assumed to have invested new capital to the amount of the increased valuations in the war and early postwar periods, but it may be said with assurance that during the prewar period they invested large sums in replacing and enlarging building equipment which had depreciated heavily before July 1, 1921, when the valuation was made showing $7.90 per acre.

investment which the owners added to the original outlay for real estate, this one may be accepted as a rough indication. On this basis the net increment was approximately $86.58 per acre,[6] an average of $3.46 per acre for each of the 25 years. Expressed on the basis of the valuation in 1896, $86.58 is 468 per cent and $3.46 is 18.7 per cent.

When net increments are added to net rents, an even more striking result is shown. By allowing for $2.10 primary net rent per acre, a yearly figure for increment and rent is shown as $5.56, or 30.1 per cent on the original valuation.

RATE EXPRESSION OF RENTS AND INCREMENTS

These changes may be expressed in terms of compound interest. From one point of view it is incorrect to say that the owners invested but $18.50 an acre at the beginning of the 25-year period and $6 an acre more during the period. The valuation of the real estate was established on higher levels at intervals throughout this period. The owners could have taken their profits from increased realty prices at almost any time during the period. If they had done so and reinvested their money in bonds, for example, or left it in a savings account to compound once or twice a year, they would have calculated the rates of return from these higher levels.

Had the amount of the original investment been put at interest at 8 per cent and had the principal been allowed to grow by yearly compounding, the sums attained would have been but little different from those to which the net increments would have brought the valuations. If these increments had so proceeded as to be most nearly approximated by interest additions compounded from the original investment at 5.6 per cent per annum, the yearly addition would have been practically the same as the primary net rents actually received. If an annual compounding rate of 9.2 per cent were applied to the original investment the yearly additions would correspond closely to the yearly benefits that accrued to those owners from net increments and primary net rents combined. Persons lending money on first farm mortgage security in the neighborhood of these farms obtained an average of 6.4 per cent during the period 1896–1920. The return in the form of primary net rent was but little short of the return these farmers might have had on the equivalent of the original investment loaned out, with the yearly interest reinvested in similar loans. The return in the form of net increment was considerably in excess of such returns on mortgage investments. Increment was practically paralleled by net increases in equities, since but little of the increment was withdrawn in the form of borrowings against the increased valuations. The returns in the form of primary net rent were applied but little as reinvestment funds in this property, and can be considered to have been devoted to the current consumption of the owners. Through the combination of rental and incremental returns this land surpassed mortgage lending as an investment. The principal advanced, as if accumulating a return larger than the mortgage rate; but at the same time there was a side return in the form of rent available for current disposal. The good fortune of the land investor is less impressive,

[6] Five years showed decrements in a total of $3.49 and 20 years showed increments in a total of $90.07.

however, when allowance is made for the purchasing power of the increments and rents thus far expressed in money.

NOMINAL v. REAL RENTS AND INCREMENTS

The rents and increments discussed in the preceding paragraphs were expressed in terms of money which varied from year to year in its power to exchange for commodities. From the standpoint of persons who must convert commodities into money rent or money increment, and from the standpoint of those who must convert money rents and increments into commodities, the rents and increments thus far presented are merely nominal. By reducing rents and increments to their commodity equivalent it is possible to learn how these farms performed as producers of real rent and increment.[7]

Instead of an average annually compounded yearly return of 9.2 per cent for rent and increment combined, as expressed on the unconverted-money basis, the percentage on the converted-money basis was 6. For increment alone, the corresponding reduction is from 5 to 3.5 per cent. However, for mortgage investments the average yearly return was only 6.4 per cent.

THE TRENDS IN OWNERSHIP CONDITIONS

The factors that affected the economic position of the owners of the 16 selected farms will be treated in this section from the standpoint of their general trends over the quarter century 1896–1920. In a later section more particular attention is given to the short-swing movements above and below these trends. Though important, the short-swing movements must be considered in the light of these major long-swing movements.

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[7] The expression of rents and increments in terms of unconverted money—that is, money without reference to its purchasing power—is well adapted to the situation of persons who are under heavy obligations to pay off mortgage debts and meet other obligations for fixed amounts of money. The expression of rents and increments on the basis of commodities or converted money, however, is better fitted to the situation of those rent payers who are producing commodities with which to pay rent and of those rent receivers who are little disturbed by fixed money obligations and who are interested more particularly in the standard of living their families can maintain by converting rents and increments into articles for consumption. The index numbers of wholesale prices of commodities published by the United States Bureau of Labor Statistics were made the basis of a calculation to obtain for each year a "conversion index" by which to multiply the figure representing dollars of rent or increment of a given year in order to obtain the number of dollars of the purchasing power of 1920 required to equal it. The result was to convert the variable money of the respective years to the purchasing power of 1920.

TABLE 4.—*Arithmetic trends of factors affecting the economic position of owners, Chaffee farms, Cass County, N. Dak., 1896–1920*

Factor	Amounts in middle and terminal years [1]			Change, 1896–1920	Direction of trend	Yearly change		
						Amount	Percentage of ordinates of—	
	1896	1908	1920				1896	1920
Costs per acre assumed by owners:				*Per cent*			*Per cent*	*Per cent*
Plowing	$0.27	$0.23	$0.19	29.6	Down	$0.003	1.11	1.58
Seed	.35	1.06	1.77	405.7	Up	.059	16.85	3.33
Threshing	.16	.23	.30	87.5	Up	.006	3.75	2.00
Repairs	.36	.28	.20	44.4	Down	.007	1.94	3.50
Supervision and general expenses	.46	.62	.78	69.6	Up	.014	3.04	1.79
Real estate taxes per $100 worth of real estate	.74	.55	.37	50.0	Down	.015	2.03	4.05
Wheat price spreads:								
Amenia-Minneapolis—								
Per bushel	.092	.105	.118	28.3	Up	.001	1.09	.85
Per $100 worth (Amenia)	16.10	11.24	6.38	60.4	Down	.405	2.52	6.35
Amenia-Liverpool—								
Per bushel	.203	.166	.128	36.9	Down	.003	1.48	2.34
Per $100 worth (Amenia)	33.52	19.74	5.96	82.2	Down	1.148	3.42	19.26
Increments (net):								
Unconverted, per acre	.17	3.46	6.75	3,870.6	Up	.274	161.18	4.06
Converted, per acre	−1.74	7.76	17.27	----------	Up	.792	--------	4.59
Per $100 worth of real estate	4.47	6.33	8.18	83.0	Up	.155	3.47	1.89

[1] These are ordinates of trend. See footnote, page 11.

TABLE 5.—*Logarithmic trends of factors affecting the economic position of owners, Chaffee farms, Cass County, N. Dak., 1896–1920*

Factor	Amounts in middle and terminal years [1]			Change 1896–1920	Direction	Rate of yearly change
	1896	1908	1920			
Yields per acre (wheat land only):				*Per cent*		*Per cent*
Physical (bushels)	15.50	11.94	9.19	40.7	Down	2.20
Value	$9.63	$13.06	$17.70	83.8	Up	2.57
Prices:						
All commodities (index)	50.03	102.52	210.04	319.8	Up	6.16
Bushel of wheat	.62	1.09	1.92	209.7	Up	4.82
Crop receipts per acre	2.69	4.16	6.44	139.4	Up	3.70
Costs per acre (5 items)	1.67	2.32	3.24	94.0	Up	2.79
Real estate taxes per acre	.12	.22	.43	258.3	Up	5.55
Real estate valuation per acre	15.64	42.16	113.70	627.1	Up	8.40
Rate of interest per $100	7.18	6.32	5.57	22.4	Down	1.07
Primary net rents:						
Unconverted per acre	[2] .97	[2] 1.85	[2] 3.54	[2] 264.9	Up	6.71
Converted per acre	[2] 3.93	[2] 4.75	[2] 5.73	[2] 45.8	Up	1.73
Per $100 real estate	[2] 6.09	[2] 4.55	[2] 3.39	[2] 44.3	Down	2.69

[1] These are ordinates of trend. See footnote, page 11.
[2] To avoid negative rents the five-year moving average was substituted in place of the actual figures for rent, the terminal dates being 1898 and 1918 in this instance.

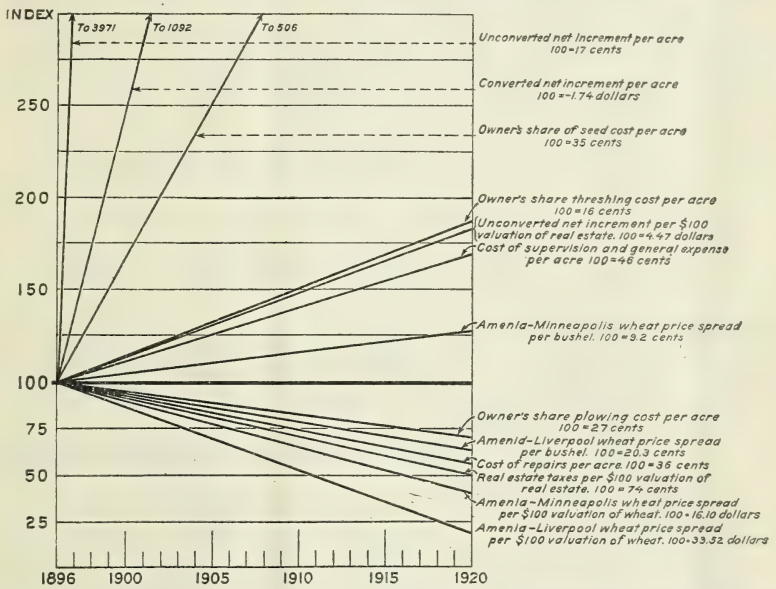
Trends of two varieties are shown in Tables 4 and 5 and in Figures 1 and 2. Trends of the former variety—the arithmetic—are computed so that yearly changes are by constant amounts, as, for example, an increase of 10 cents a year, whereas trends of the latter variety—the logarithmic or geometric—are computed so that yearly changes are at constant rates, as, for example, a decrease of 2 per cent a year. When ratio charting paper is used for plotting the geometric trends they appear as straight lines, but when natural-scale paper is used only the arithmetic trends appear as

straight lines. Figure 1 is drawn to the natural scale and shows only the trends of factors best treated arithmetically, these being the factors for which Table 3 includes data. Figure 2 is of the ratio variety and shows only the trends of factors best treated geometerically,[8] these being the factors for which data are included in Table 5.

FACTORS WITH UPWARD TRENDS

Of the factors affecting the economic situation of these owners during the period 1896–1920, the following had trends toward higher figures when no allowance is made for changes in the general purchasing power of money:

Trends of Factors Having Annual Changes of Relatively Uniform Amounts, Selected Farms, North Dakota, 1896–1920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To 506
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1896
1900
1905
1910
1915
1920
Unconverted net increment per acre 100=17 cents
Converted net increment per acre 100=1.74 dollars
Owner's share of seed cost per acre 100=35 cents
Owner's share threshing cost per acre 100=16 cents
Unconverted net increment per $100 valuation of real estate. 100=4.47 dollars
Cost of supervision and general expense per acre 100=46 cents
Amenia-Minneapolis wheat price spread per bushel. 100=9.2 cents
Owner's share plowing cost per acre 100=27 cents
Amenia-Liverpool wheat price spread per bushel. 100=20.3 cents
Cost of repairs per acre. 100=36 cents
Real estate taxes per $100 valuation of real estate. 100=74 cents
Amenia-Minneapolis wheat price spread per $100 valuation of wheat. 100=16.10 dollars
Amenia-Liverpool wheat price spread per $100 valuation of wheat. 100=33.32 dollars

FIG. 1.—The changes here shown as experienced by the owners of selected farms in most cases were such as to strengthen their economic position

AMOUNTS PER ACRE

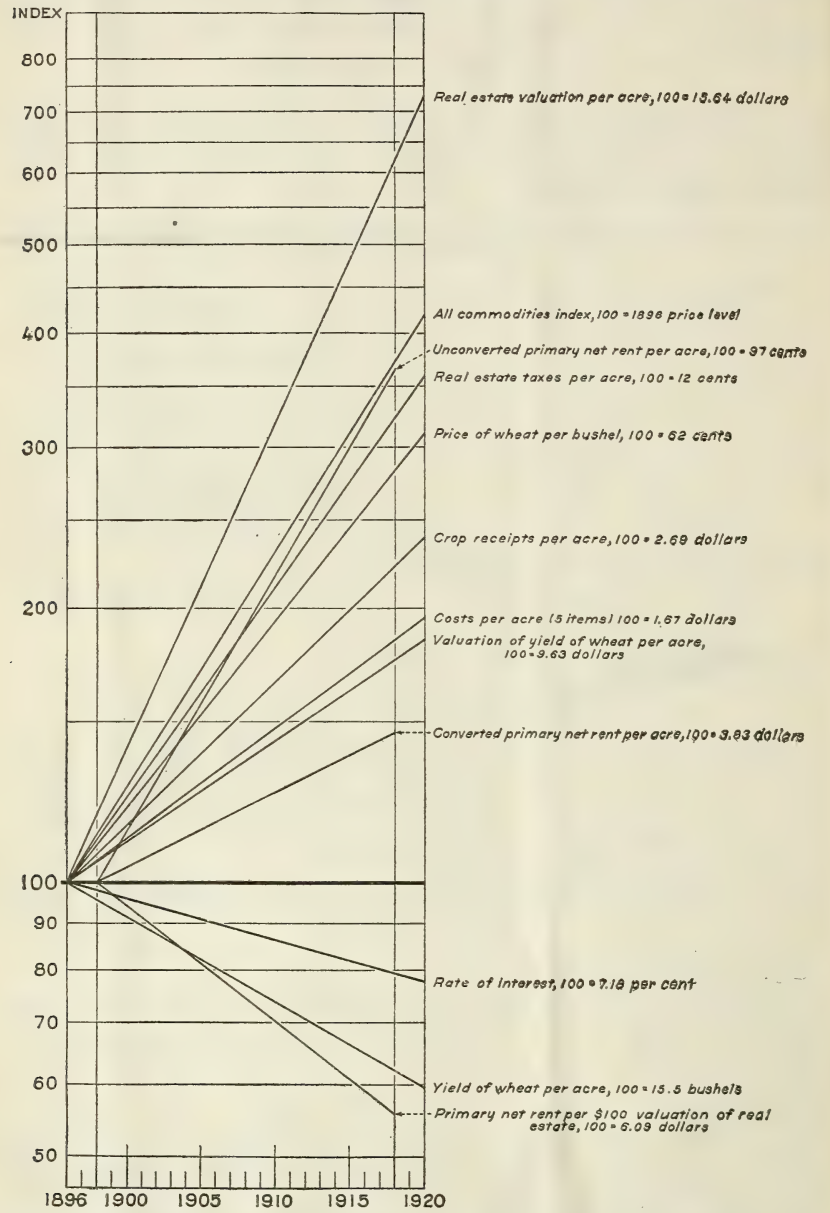
Value of wheat yield.
Receipts from sale of all crops raised.
Expenditures for five items of cost to landowners, and especially for seed, threshing, and supervision and general expense.
Real-estate taxes.
Market valuation of real estate.
Net rents.
Net increments.

[8] Owing to the marked advance of commodity prices during the period 1915–1919, compound interest curves do not fit the data as well as some of the higher-plane curves. To avoid further complexity of treatment, however, no geometric trends are shown here to correspond to higher-plane curves.

Sine curves were used by Prof. Henry L. Moore, of Columbia University, to describe trends in crop yields in North Dakota. Because of the relatively short span of time covered in the present investigation, it would be of little use to fit sine curves to the data on yields or other factors.

The conception of a trend followed here is that of a unified course of movement observed over an entire period of considerable length.

Trends of Factors Having Annual Changes at Relatively Uniform Rates, Selected Farms, North Dakota, 1896–1920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700
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1896
1900
1905
1910
1915
1920
Real estate valuation per acre, 100 = 13.64 dollars
All commodities index, 100 = 1896 price level
Unconverted primary net rent per acre, 100 = 97 cents
Real estate taxes per acre, 100 = 12 cents
Price of wheat per bushel, 100 = 62 cents
Crop receipts per acre, 100 = 2.69 dollars
Costs per acre (5 items) 100 = 1.67 dollars
Valuation of yield of wheat per acre, 100 = 9.63 dollars
Converted primary net rent per acre, 100 = 3.83 dollars
Rate of interest, 100 = 7.18 per cent
Yield of wheat per acre, 100 = 15.5 bushels
Primary net rent per $100 valuation of real estate, 100 = 6.09 dollars

FIG. 2.—These changes in most cases were favorable to the landowners, particularly the decline in the interest rate and the increase in crop receipts. The decline in yield of wheat per acre and the increase in taxes were adverse factors

AMOUNTS PER COMMODITY UNIT

Price of all commodities entering index list.
Price of wheat.
Spread in price of wheat between Amenia and Minneapolis.

In the case of net increments per acre and of spread per bushel in the price of wheat between Amenia and Minneapolis, the best fitting trends were arithmetic; but in the case of the other factors having upward trends compound-interest curves were best.

The slope of the trend was steepest in the case of unconverted net increments; that is, net increments expressed in terms of money of the respective years, the ordinate[9] of the net increments for 1920 being thirty-nine times that of 1896. This stands in marked contrast with the trend of the spread in wheat price between Amenia and Minneapolis in which the 1920 ordinate was but one and two-tenths times that of 1896. The relative amounts of increase in the case of the other factors[10] were such as to put them in the following order, factors with steepest trends preceding: Real-estate valuation per acre; prices of all commodities; real-estate taxes per acre; wheat prices; primary net rents (unconverted); costs per acre (five items); value of wheat yield; and primary net rents (converted).

The order of the factors is somewhat different here from that in which they stand when only so much of the quarter century is included as preceded the World War. The order of the first six of the factors for the pre-war period was: Primary net rents (unconverted); real-estate valuations; real-estate taxes; wheat prices; prices of all commodities; and cost per acre (five items). Evidently the figures of the years following 1914 were of such magnitudes as to put the slope of the trends of real-estate valuations, prices of all commodities, taxes, and wheat prices above that of primary net rent, and to put the prices of all commodities above real-estate taxes and wheat prices. The group of trends for the 19-year period showed a strengthening of the owner's position in terms of current income and purchasing power more than is shown by the group of trends for the entire quarter century, and his position was correspondingly weakened in the period following 1914.

Over the entire 25-year period farm real-estate valuations per acre showed an upward movement at the rate of 8.4 per cent yearly. The corresponding rate for the prices of all commodities was 6.2 per cent; for unconverted primary net rents, 6.7 per cent; for real-estate taxes, 5.6 per cent; and for five cost items, 2.8 per cent. The low average rate of advance in the five cost items was due to the fact that two of the five cost items had downward trends and only one of the other two had more than doubled. Real-estate taxes, although not costs in the same sense as the five selected items of expense, were outlays which advanced more rapidly than the five selected costs but less rapidly than primary net rents.

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[9] An ordinate is a vertical line erected upon the base line at a point representing any year in the quarter century to which the line of trend applies. It is terminated by the base line on the one hand and the trend line on the other. A distinction should be made between the actual data of an ownership factor for any year and the ordinate of trend for that year. Although the ordinates of trend are greater than the actual data by certain amounts in some years and less in others, the trend is so computed that the sum of the squares of these differences is as small as possible. The slope of the trend is merely the ratio of the ordinate of the final year to that of the initial year.

[10] The slope of trends represented by compound-interest curves, as these are, is less suitably shown as a ratio of the ordinates of the beginning and final years.

Of the various factors with upward trends, however, increments in valuation per acre were the most striking. Increments per acre were much larger than increments per $100 worth of real estate during the years when it took from 1 to 5 acres to be worth $100. Even in 1920 the increment per $100 worth of real estate was nearly double what it was in 1896, considering the trend ordinates of these terminal years.

FACTORS WITH DOWNWARD TRENDS

Of the factors affecting the economic position of the owners of these farms the following had downward trends between 1896 and 1920:

AMOUNTS PER ACRE

Physical yield of wheat.
Cost of plowing.
Cost of repairs.

AMOUNTS PER BUSHEL

Wheat price spread between Amenia and Liverpool.

AMOUNTS PER $100 VALUE

Wheat price spreads between Amenia, on one hand, and Minneapolis and Liverpool, on the other.
Interest on money borrowed on first mortgage security.
Taxes on real estate at current market valuations.
Net rents from real estate at current market valuations.

The decrease in the amount of primary net rent per $100 worth of real estate was at an annual rate of 2.7 per cent. The corresponding rates of decrease in physical yield of wheat land was 2.2 per cent, and in amount of interest paid per $100 borrowed was 1.1 per cent. These three factors had trends best represented by compound discount curves.

To bring all nine items into comparison, the steepness of descent is best measured in terms of the ordinates of 1896 and 1920. The 1920 ordinates of three factors were about half those of 1896. These are repairs per acre, real estate taxes per $100 valuation of real estate, and wheat price spreads per $100 worth between Amenia and Minneapolis.

The reduction in the wheat-price spread per $100 worth between Amenia and Liverpool was greater than that shown in any other item. In 1920 the ordinate of trend in this case was between a fifth and a sixth of what it was in 1896.

INTERRELATION OF TRENDS

One of the purposes in tracing the trends in factors affecting the ownership of these farms is to ascertain wherein they show individual and related characteristics.

There was a decline in physical yields on these farms. The downward trend in the yield of wheat land is one evidence. A comparison of the trends of crop receipts per acre (shown in Table 5) with the price trends of products raised seems to indicate that the decline in physical yields extended to land in other crops as well. Despite the tendencies toward lower physical yields there was a trend toward a higher value produced per acre, as evidenced here

in the case of wheat. This resulted from the marked upward trend in the local market valuation per unit of farm products, particularly bushels of wheat.

In its turn, the local market valuation of farm products, particularly wheat, was increased both because of higher valuations prevailing in the central markets and because of diminished spreads between the central markets and the local market. These spreads were shown to have declined both in cents per bushel, as in the case of the spread between Amenia and Liverpool, and in cents per dollar's worth, as in the case of the spread between those points as well as between Amenia and Minneapolis. In other words, the ratio of the spreads to the price of wheat, in either local or central markets, was diminished. There was also a decrease in the ratio of the spreads to the wholesale prices of commodities entering the index number list. On the other hand, the power of wheat to command in exchange the general run of wholesale commodities was increased according to its valuation both in local and central markets.

It therefore appears that the economic position of the owners of these farms was improved, in spite of the decreasing average yields per acre, by reason of the increased value of the physical units produced and because of the cheapening of marketing service, particularly transportation, as measured in terms of commodities. Figuratively speaking, economic improvements outside of these farms, until the last part of the quarter century, were having the effect of moving these farms closer to the central markets.

Economies practiced outside these farms also apparently strengthened their economic situation in other ways. Considering, for example, the decrease in the money cost of plowing, or, in fact, the decrease in the commodity equivalent of all five selected costs combined, the decline in these items is not to be attributed solely to economies practiced within these farms. External economies to be credited in various degrees for a large part of this change include improvements in the types of machinery used in plowing, improvements in manufacturing and marketing this machinery, and various other improvements connected with making this machinery cheap. Without internal economies resulting from exercise of good farm management, however, the decrease in cost ratios could scarcely have been realized to the extent indicated by these records.

The trend of the five selected cost items (Table 5) bears an influential relationship to the trend of primary net rents. The trend of real-estate taxes, another item of costs as viewed from the standpoint of the owners, has a similarly close relation to the trend of secondary net rents. In the race between primary and secondary net rents on the one hand, and the movement of commodity prices on the other hand, these cost factors come into account.

The explanation is as follows: The trend of increase of five cost items was upward at about half the slope of the trend in crop receipts. Primary net rents, therefore, had an upward trend more marked than that of crop receipts. However, since the upward trend of commodity prices was nearly as steep as that of primary net rents, the purchasing power of primary net rents barely escaped a downward trend. If the upward trend in the price of wheat had not

been more rapid than the upward trend in the price of all commodities, and if the upward trend in the five items of cost had not

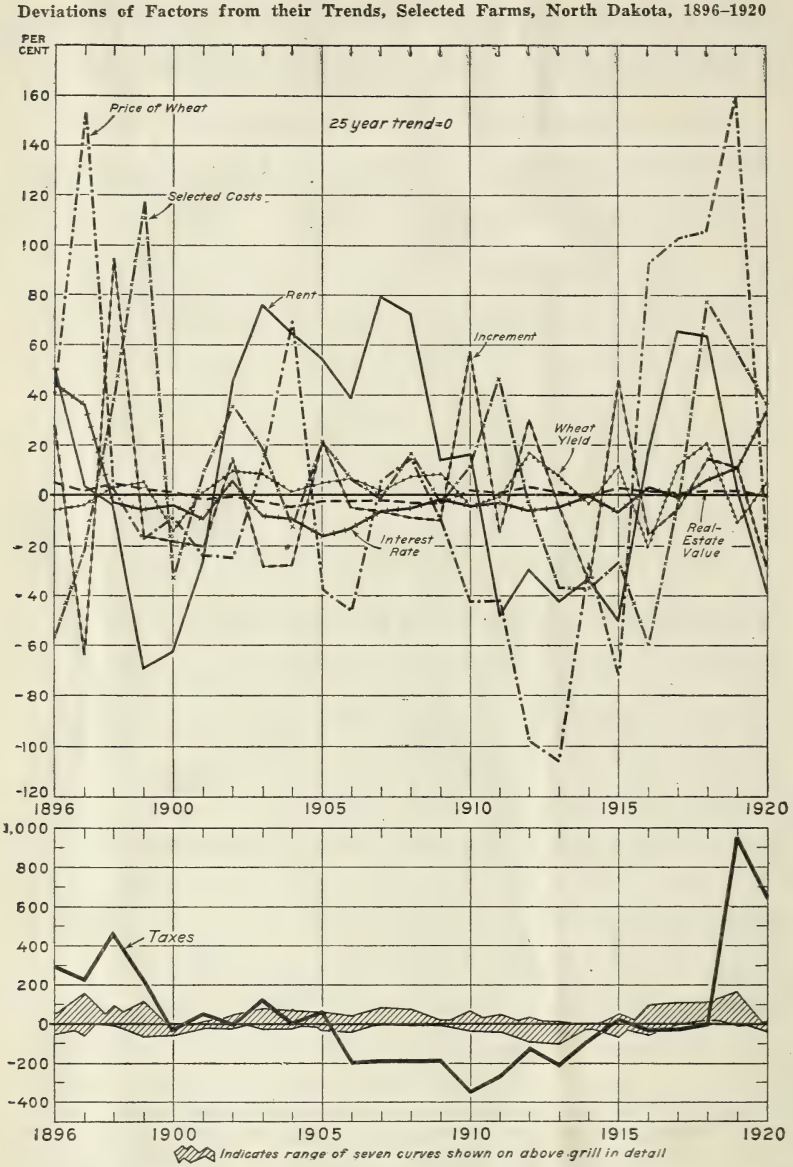

FIG. 3.—Real estate taxes were more variable relative to their standard deviation than were other elements shown here. This is due largely to the fact that the standard deviation was small in the case of taxes. This graph shows especially the duration and intensity of deviations at various points in the quarter century. Deviations expressed as percentages of standard deviations from trends of factors having annual changes at relatively uniform rates

been less rapid, the trend of the purchasing power of primary net rents would probably have been downward. Moreover, the upward

trend in primary net rents was more than offset by upward-moving real-estate taxes. In other words, secondary net rent showed a downward trend when expressed in terms of purchasing power. In short, the abnormally rapid increase of real-estate taxes was responsible for converting a slightly upward trend of primary net rent in terms of purchasing power into a downward trend of secondary net rent as thus measured.

Much of the compounding or geometric character in the data of the factors traced here may be fairly attributed to the fact that a given amount of money was becoming increasingly easier to get in exchange for a fixed amount of product. This tendency was maintained over most of the quarter century and was most marked during the last years.

An important influence in the trend of land valuation was the decrease in the interest required each year for the use of a fixed

Rents Compared with Increments in Value of Land, Selected Farms, North Dakota, 1896–1920

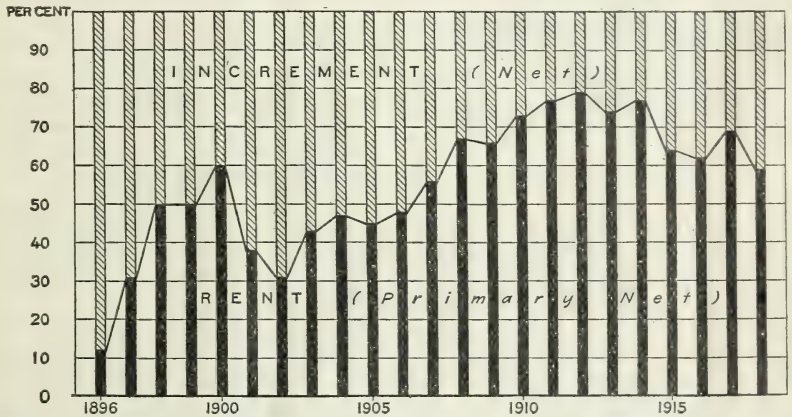

FIG. 4.—Two sources of economic benefits are shown here in relation to one another. Increment was the major source during the first half of the quarter century. Data for each year are based on moving averages for five years centering in that year

amount of borrowed cash capital. The market from which capital was borrowed and to which products were sold was evidently supplying money to the owners of these farms on terms that were easing gradually but persistently.

DEVIATIONS FROM TRENDS IN OWNERSHIP CONDITIONS

As shown in figures 3 and 4, the extent to which the yearly data approximated or stood away from the lines of trend is studied in the case of eight factors. The variability of primary net rent per acre was about the same as that of physical yield of wheat and considerably larger than that of price of wheat per bushel.

That the deviations in primary net rent per acre occurred in more marked correlation with those of the price of wheat than with those of the physical yield of wheat per acre is indicated in Table 6. In both cases the correlation is direct, as might be expected, but in neither case does the correlation coefficient stand high enough to indicate close conformity with movements in primary net rents.

A more marked correlation is shown between variations of rent and price than between those of rent and yield. This is consistent with similar indications shown earlier in terms of trends.

TABLE 6.—*Indexes of correlation between primary net rent and seven ownership factors, 1896–1920*

Factors [1]	Gross correlation [2]		Net correlation [3]	
	Coefficient [4]	Probable error [5]	Coefficient [4]	Probable error [5]
Primary net rent with—				
Price of wheat per bushel	+0.44	0.11	+0.57	0.09
Physical yield of wheat	+.26	.13	+.47	.11
Five selected costs	−.06	.13	+.28	.12
Real-estate loan rate	−.03	.13	+.40	.11
Real-estate tax	−.11	.13	+.01	.13
Real-estate valuation	−.14	.13	+.14	.13
Real-estate increments	−.02	.13		

[1] Per-acre basis, except where otherwise stated.
[2] Simple correlations without allowances mentioned in footnote 3.
[3] Allowances are made for cross correlations among the three factors grouped together by the horizontal lines.
[4] Pearsonian coefficient of correlation of deviations expressed in the case of each year as a percentage of its ordinate of trend.
[5] Probable error is shown here for the convenience of those who do not agree with the contention that the mathematical theory of probability is inapplicable to consecutive items of a statistical time series. (Journal of the American Statistical Association, Vol. XIX, March, 1924, p. 7.)

ANTICIPATIONS OF THE FUTURE BY OWNERS

The net rents received currently in all but five of the years were too small to pay a rate on the market valuation of these farms equal to that which one might have received on first mortgage loans made directly on similar farms in the same county.

In other words, a valuation computed by capitalizing rents at current rates of interest is less than market valuation during four-fifths of the quarter century. Except for the years, 1915–1917, the amount of the excess of the computed valuation over the market valuation was progressively larger each year beginning with 1909. In this real estate there was either a growth of valuation elements not included in the computations or else future expectations of reduced interest rates or of increased rents were having an enlarging influence in the determination of the purchase price.

It is possible that both kinds of influence were at work in the present case. It is desirable to render to each of the types of influence its fair share of responsibility, but it is very difficult to do so. It is necessary, first of all, to examine the formulas used in the computations. [11]

[11] Formulas of interrelation of (1) valuation of productive real estate, (2) rate of capitalization, (3) net annual rental production, and (4) annual amount of increase or decrease of net annual rental production assumed for the future:

Let v = valuation of productive real estate.
r = rate of capitalization.
a = net rental production of real estate in specified year.
c = annual amount of change in *a* expected in subsequent years.

The formulas follow:

Solving for valuation, $v=\frac{a}{r}+\frac{c}{r^2}$.

Solving for rate of capitalization, $r=\frac{a\pm\sqrt{a^2+4cv}}{2v}$.

Solving for anticipation of rental changes, $c=r\,(vr-a)$.

Solving for present capitalizated value of anticipated rental changes, $\frac{c}{r^2}=v-\frac{a}{r}$.

ASSUMPTIONS IN USING VALUATION FORMULAS

The formulas are designed to define the relationship between real-estate valuations on the one hand, and on the other hand the rate of capitalization, the amount of rental income, and the anticipated changes in rental income expected from time to time by those who contribute the marginal supply and demand that determine the market valuation of this real estate.

These formulas are more commonly used to compute the rate of capitalization when the other factors are known. In this case, however, current rates of interest are assumed to be identical with current rates of capitalization.[12] On this basis it is possible to compute divergences that may indicate the amount of the futurity element present in the valuations at various times.

Before taking it for granted that the full amounts of the indicated divergences are to be regarded as measuring the futurity element accurately, it is necessary to examine some of the limitations of the method and the data.

In making the indicated use of current interest rates, rates paid by borrowers are used instead of net rates received by lenders. No deductions for commission, guaranty, or other charges are taken into account. The interest rate is that which the lenders received only in case they avoided paying for services by intermediaries. It is assumed that the ratio of tax to income in the case of first farm-mortgage loans in no instance exceeded the ratio of tax to income in the case of these farms. The expected changes in long-time investment loan rates are taken into account only so far as they conform to those anticipated in the general money market and so far as they are allowed for in the current rates by the tendency to discount future trends as forecasted in that broader market. To whatever extent actual or potential owners of this real estate expected changes in long-time investment rates proportionally larger or smaller or otherwise different from those taken into account by the general money market, the data used here are inadequate. Under the formulas used, all such imperfections are concealed influences modifying, to an unknown extent, the indicated future expectations as to rental income.

It is also assumed that those portions of the total farm real estate which are primarily used for the consumption of the operator, for example, the farmstead, pasture for cows milked for family use, ground cultivated for the operator's family living, and other perquisite real estate, occupy as large a proportional place in the rent as in the valuation of the real estate. In certain individual years it would not be entirely correct to make this assumption, and in comparisons between farms it is difficult to be assured that rents are varied to correspond with differences in these items. The desirableness of the community as a living place was probably a uniform element in the valuation of these farmsteads. The distance of the dwellings from town may have varied the valuations of the farmsteads, just as they probably varied the valuations of the other parts of the farms. Anticipations of the future may not in all cases have affected the real estate used for subsistence in the same way that

[12] Grounds for such action are given in U. S. Dept. Agr. Bull. 1224, Relation of Land Income to Land Value, by C. R. Chambers.

they affected real estate used to produce for the market. In general, however, it is fair to assume that consumption real estate entered into the rents in about the same degree that it entered into the valuations.

TABLE 7.—*Market v. computed valuations, selected farms, 1896–1920*

Date	Market valuation per acre of real estate	Rate of interest on farm mortgages[2]	Interest on real estate valuation	Rents per acre, 5-year average[1]		Value computed by capitalizing rents at interest rates[4]	
				Primary	Secondary[3]	Primary	Secondary[3]
		Per cent					
1896	$18.50	8.28	$1.532	$1.08	$0.93	$13.04	$11.23
1897	18.00	8.02	1.444	1.15	1.00	14.34	12.47
1898	21.50	7.68	1.651	.73	.58	9.51	7.55
1899	22.00	7.10	1.562	.76	.61	10.70	8.59
1900	22.50	6.64	1.494	.95	.80	14.31	12.05
1901	22.00	6.52	1.434	1.19	1.03	18.25	15.80
1902	25.00	6.42	1.605	1.49	1.33	23.21	20.72
1903	25.00	6.24	1.560	2.00	1.82	32.05	29.17
1904	25.00	6.14	1.535	2.18	2.01	35.50	32.74
1905	30.00	6.06	1.818	2.20	2.02	36.30	33.33
1906	32.50	6.02	1.956	2.45	2.27	40.70	37.71
1907	35.00	6.02	2.107	2.59	2.41	43.02	40.03
1908	37.50	6.06	2.272	2.17	1.99	35.81	32.84
1909	40.00	6.08	2.432	2.19	2.00	36.02	32.89
1910	53.00	6.02	3.191	2.10	1.90	34.88	31.56
1911	55.00	5.96	3.278	1.78	1.57	29.87	26.34
1912	65.00	5.90	3.835	1.40	1.18	23.73	20.00
1913	69.00	5.82	4.016	1.96	1.71	33.68	29.38
1914	67.50	5.80	3.915	1.67	1.39	28.79	23.97
1915	82.50	5.78	4.768	2.65	2.35	45.85	40.66
1916	85.00	5.80	4.930	3.66	3.32	63.10	57.24
1917	90.00	5.82	5.238	3.67	3.23	63.06	55.50
1918	100.00	6.06	6.060	3.60	3.09	59.41	50.99
1919	110.00	6.36	6.996	3.52	2.90	55.35	45.60
1920	110.00	6.52	7.172	2.49	1.80	38.19	27.61

Date	Excess[5] of market valuation over computed valuation				Constant yearly increase of rent needed to make rents produce on market valuation a percentage equal to interest rate	
	Primary		Secondary[3]			
	Amount	Per cent	Amount	Per cent	Primary	Secondary
1896	$5.46	41.9	$7.27	64.7	$0.037	$0.050
1897	3.66	25.5	5.53	44.3	.024	.036
1898	11.99	126.1	13.95	184.8	.071	.082
1899	11.30	105.6	13.41	156.1	.057	.068
1900	8.19	57.2	10.45	86.7	.036	.046
1901	3.75	20.5	6.20	39.2	.016	.026
1902	1.79	7.7	4.28	20.7	.007	.018
1903	−7.05	−22.0	−4.17	−14.3	−.027	−.016
1904	−10.50	−29.6	−7.74	−23.6	−.040	−.029
1905	−6.30	−17.4	−3.33	−10.0	−.023	−.012
1906	−8.20	−20.1	−5.21	−13.8	−.030	−.019
1907	−8.02	−18.6	−5.03	−12.6	−.029	−.018
1908	1.69	4.7	4.66	14.2	.006	.017
1909	3.98	11.0	7.11	21.6	.015	.026
1910	18.12	51.9	21.44	67.9	.066	.078
1911	25.13	84.1	28.66	108.8	.089	.102
1912	41.27	173.9	45.00	225.0	.144	.157
1913	35.32	104.9	39.62	134.9	.120	.134
1914	38.71	134.5	43.53	181.6	.130	.146
1915	36.65	79.9	41.84	102.9	.122	.140
1916	21.90	34.7	27.76	48.5	.074	.093
1917	26.94	42.7	34.50	62.2	.091	.117
1918	40.59	68.3	49.01	96.1	.149	.180
1919[6]	54.65	98.7	64.40	141.2	.221	.261
1920[7]	71.81	188.0	82.39	298.4	.305	.350

[1] Except for 1919, when the average is for 3 years and for 1920, when it is for 1 year. The year indicated is the middle year of the 3 and 5 year groups as averaged.
[2] Rate at which interest was paid on an aggregation of 10 typical first farm-mortgage loans on similar land in Cass County, the figures shown here being 5-year moving averages.
[3] Primary net rents less real-estate taxes.
[4] Without regard to anticipated changes.
[5] Or deficit.
[6] Based on average for 3 years.
[7] Based on data for single year.

To compute a valuation of real estate on the basis of rents from which taxes have not been deducted would lead to its overvaulation as compared with a mortgage investment yielding interest to the same amount. On the other hand, to compute the value of real estate on the basis of rents from which all real-estate taxes have been deducted might lead to undervaluation of real estate as compared with mortgage investments. The undervaluation would rest upon two facts. One is that some real-estate taxes, such as special assessments, may react favorably on the valuation of the property, the other that mortgage investments also have some tax burdens to bear. By using primary net rent, from which no real-estate taxes have been deducted, the most liberal valuation of the real estate can be ascertained. Then, by using secondary net rent, from which all real-estate taxes have been deducted, the least liberal valuation can be derived. A range is thus established within which account can be taken of the tax factor according to conditions.

It should be pointed out that the owners may have actually anticipated changes in some of these items that were widely different from those indicated in Table 7. These are merely the minimum amounts of change which, in the light of the rents and interest rates of the various periods, would have had to be counted upon in order to put the real-estate returns on a bare equality with first farm-mortgage loans. Being merely amounts of change that were mathematically necessary to fulfil certain minimum requirements, these figures should not be taken to represent the full expectation of these owners or others whose influence affected the valuation of this real estate.

A PERIOD IN WHICH COMPUTED VALUATIONS WERE MORE THAN CURRENT MARKET VALUATIONS

Both primary and secondary net rents[13] were a larger percentage of the market valuation of the real estate in the years 1903–1907 than was interest earned on first farm-mortgage loans of similar amounts. This real estate in those years could be said to have been undervalued by from $6.30 to $10.50 an acre, that is, from 17 to 30 per cent, when real-estate taxes are not deducted from rents; otherwise from $4.17 to $7.74, or from 10 to 24 per cent. A decrease of from 2 to 4 cents a year in primary net rent and from 1 to 3 cents in secondary net rent could have been counted upon without entirely overcoming this undervaluation.

During this 5-year period, 1903–1907, the market valuation of the real estate advanced at an average of $2 an acre a year but failed to advance promptly enough to allow for both the declining rates of interest and the advancing rents. Why did not the market valuation run ahead of the movements in these factors as during other portions of the quarter century? The explanation lies mainly in the effects of the rush for wheat land in areas north and west of the section in which these farms are located. This rush carried well into the prairie Provinces of Canada. Persons coming into the spring-wheat belt to buy land to operate were carried in unusual proportions beyond this section of North Dakota. The exodus of farm tenants experienced in eastern North Dakota conditions was also a disturbing factor for persons who might have bought land in

[13] Terms defined on p. 5.

eastern North Dakota for operation by lessees. Such owners were put to special pains to supply inexperienced tenants with credit, equipment, and supervision. An investigation of the rents paid by experienced as compared with inexperienced tenants on these farms confirms the natural expectation that under uniform share contracts used by these owners the latter paid less.[14] Despite the handicaps of such a period, rents advanced relatively more than realty valuations, even when rents paid by inexperienced tenants are mixed with the others. The dominating factor was the temporary weakness of the demand side of the farm-purchase market during this period.

A PERIOD IN WHICH COMPUTED VALUATIONS WERE LESS THAN CURRENT MARKET VALUATIONS

Why did these farms during all but five years of the quarter century have market valuations higher than the computed valuations, as both appear in Table 7? It is not surprising, perhaps, that a period of undervaluation should be followed by one of overvaluation. Optimism may easily run beyond proper limits. That the period of overvaluation should be so much longer, however, and that the overvaluation should continue to be both absolutely and relatively larger with the passage of time is less easily explained.

From 1910 to 1914, although falling interest rates afforded ground for higher real-estate valuations, diminished rents more than offset them. The market valuation of real estate was still further enhanced, however, perhaps in anticipation of increased rents or lower interest rates, and went to figures between $30 and $45 per acre. Reduced interest rates, at least, did not materialize.

After the World War began, rents increased sufficiently to cut down the overvaluation of the real estate in the market to percentages as low in 1916 as 48, using secondary net rents as the basis of figuring, and 35, using primary net rents. Even in 1916 rents were not sufficient to justify valuations in excess of $57 an acre on the former basis or $63 on the latter.

Between 1916 and 1919 the computed valuation fell off nearly $10 per acre. The market valuation, however, continued to advance between $5 and $10 a year until 1920.

It is possible that some persons in this district did not require from their farms rates of net returns as high as the rates of interest demanded on first farm-mortgage loans. This may have been the case with the actual owners of these farms as well as with potential owners. The former may have retained the title to these lands because of great interest in administering landed property, because of prestige of a social type, because of desire to lead their children into agricultural careers, or because of other considerations that would lead them away from alternative lines of investment.

In exercising an influence toward higher valuations than were warranted merely on the basis of interest rates and rents, potential owners may have had one or more of a number of motives. To some extent their desire for farm real-estate ownership may have rested upon a belief that owning a farm likewise put them in possession of a workshop or factory capable of using the labor resources of the

[14] See Farm Tenants and Owners on a Corporate Estate, by Walter H. Baumgartel and Charles L. Stewart, mimeographed report, U. S. Dept. Agr.

family under conditions independent of the direction of employers other than themselves. Again, their desire to own farm real estate may have been founded on expectation of enjoyments not fully stated in terms of dollars and cents. Some may have been actuated by the belief that owning the land afforded an opportunity to make the property develop a use value to them much larger than that indicated by the amounts paid by tenants.

During some of the later years these farms were being held at prices which, assuming no decline from the high interest rates prevailing, would require a constant annual increase of between 15 and 30 cents a year, leaving taxes out of account, and between 18 and 35 cents a year, making no allowance for tax decline. It would require considerable optimism to expect such an increase of rents to continue through the decades during which present worth would be materially influenced by such anticipations, or to expect corresponding reductions in interest rates or cooperation of the two factors to the necessary extent.

In any event, it is apparent that potential buyers who might have purchased these farms would have had to do so in 1911 or before to find the computed valuation, when at its peak in 1916, equal to the market valuation at the time they bought; and they would have had to buy in 1908 or before to find the computed valuation in 1920 larger than the market valuation when they purchased. If unable to get a larger use value than these holders and if unable to avoid paying the going rate of interest on more than half the realty valuation, it would have been impossible for the purchasers to meet interest payments on the entire valuation from the net earnings of the property and difficult to do so even if they had acquired a substantial equity. Had the tenants on these farms, for example, ventured into the ownership of such farms in 1908 or before, they would have been favored by decline of interest rates and increase of realty incomes and valuations. Had they ventured into farm purchase during periods having less helpful trends and aftermaths, their climb to a debt-free status would have taken place under greater difficulties.

From whatever motives these owners held this property or from whatever motives others wished from time to time to buy some of this property, the fact remains that these owners held the land while increments accrued upon it. The persistence and growth of the increments was marked.

From Figure 5 it appears that as a source of annual benefits to these landowners net increment outweighed primary net rent most of the former half of the quarter century included in the study. During the latter half of the period, however, rent generally outweighed increment, especially during the five years 1910–1914. After 1902 the relative prominence of increment diminished until 1912. A considerable expansion in the relative prominence of increment occurred in the years of the World War. Taking the quarter century as a whole, increment lacked but little of being of equal weight with rent. It is not surprising that dependence on increment came to be a factor in the calculations of those who owned or contemplated the purchase of farms in this district.

These owners were apparently furnishing their tenants with real estate at a rental charge per hundred dollars' worth that was much

below that which these tenants would have had to pay to buy similar property. This was an aspect of a speculative period which brought occasional decrements along with large increments. These owners probably did not relax their efforts to help the land produce rent more nearly in accord with its current market valuations in the later years. It is not surprising, however, that rents did not maintain their former high ratios in relation to real-estate valuations. Probably no amount of effort on the part of these owners could have produced this result. Their constant efforts to keep rents high doubtless helped to keep the activities on these farms suited to the conditions imposed by commercial economy. If through lower valuations these farms had gravitated into the hands of farmers under less stimulus to make them produce the largest possible surpluses, the result would have been a public disadvantage. It is to be doubted whether so wide a departure of market valuations from computed valuations was necessary in order to stimulate owners to exert themselves to maintain a level of saving power commensurate with market valuations.[15]

ADJUSTMENTS IN RENTING AND PURCHASING FARMS

It is apparent from this inquiry that three groups of influences have affected the economic position of the owners of these farms in the three decades ended in 1920. Anticipations of the future, as registered in the price level of the real estate, constitute one of these three groups. A second group is made up of the long-time trends of other factors tending to burden or benefit owners. The third group consists of the variabilities that mark these factors in their year-to-year departures from their trends.

The anticipations held by those whose actions determined the market valuation of this real estate were not borne out fully by the actual developments. Unless undue weight is given to imponderable psychic incomes, the failure of the anticipation to be borne out in later years must have resulted either from inaccurate estimation of declines in interest rates and operating expenses or of increases in yields and prices, or from both types of miscalculation. In respect to trends, however, the discrepancies between the anticipated and the realized were perhaps no greater than the discrepancies between anticipated and realized variations from the trends.

The operation of land under a share-rent contract is one adjustment made desirable by the variability of physical yield, costs, and prices. As in the case of the 16 farms included here, one phase of this adjustment is the assumption of some operating costs by owners, the gross share being enlarged to compensate the owners. The result of partial transfer of operating costs to owners in the case of these farms was to increase the variability of the primary net rent they received and to bring somewhat greater stability to the net earnings of the tenants. Apparently the risks of variation in crop yield, price, and cost were not shared by parties other than owners and tenants, except in the case of hail in some instances. In effect, the tenants paid an enlarged share of the crops to the owners to offset

[15] That somewhat similar conditions have prevailed in large areas of the United States appears to be established in "Relation of Land Income to Land Value," by C. R. Chambers, U. S. Dept. Agr. Bull. 1224.

what would otherwise have been an increased outlay and liability. According to the 1920 census, operations were on a sharing basis in the case of 93 per cent of the tenant farms of North Dakota and of 94 per cent of the tenant farms of Cass County.

Farm buyers in this and adjacent parts of the Northwest in some cases have preferred that their farm mortgages and contracts for the transfer of land contain protective provisions known as crop-payment clauses. Under these clauses the maximum which the farm buyer is held liable to pay in any one annual settlement of interest and principal is fixed in terms of the value of a certain share of the crop yearly harvested. By having his yearly liabilities adjusted to his crop receipts from year to year, one who buys on the crop-payment plan has some of the advantages of the share tenant but at the same time pays taxes and makes improvements much the same as any other owner.

Variations in Primary Net Rent per Acre, Selected Farms, North Dakota, 1896–1920

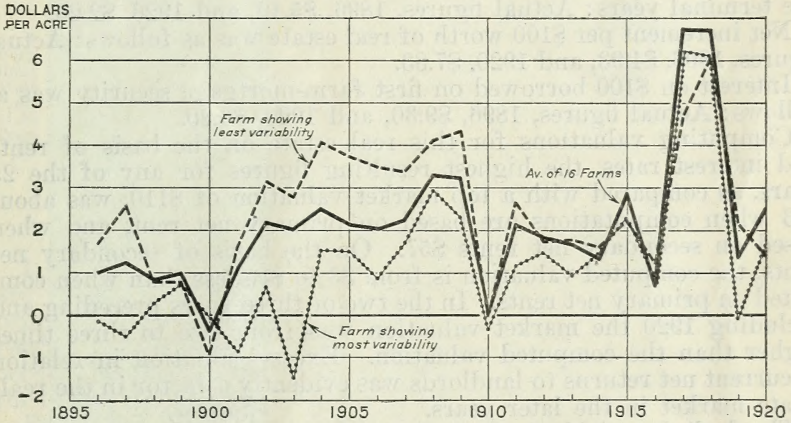

FIG. 5.—The variability of the primary net rent per acre of all land in the entire group of farms is less than the variability of primary net rent per acre of all but three farms in sixteen, when taken separately

Variable net rents and crop values shown here (see fig. 5) as characteristic of the quarter century ended in 1920, if not reduced in the quarter century following, and if not made the basis for more automatic adjustment of amounts due in annual settlement, may justify the refusal of many operators to turn from tenancy as a means of getting use of land. Unless trends in the factors affecting the economic position of owners of such land are more favorable than in the last quarter century, variableness from trends may afford an additional reason why farmers should defer purchase of land until ample resources are in hand.

SUMMARY

Phases of experience in farm ownership on which this inquiry has thrown some light are as follows:

Compared with an average gross rent of $5.20, the value of half of the products per acre, net rent averaged $2.10 when no deduction

is made for real-estate and road taxes, and $1.90 when all such taxes are deducted. The former of these two varieties of net rents is called primary and the latter secondary.

Net rents, whether primary or secondary, were a small percentage of gross rents, and net increments were a large percentage of gross increments.

Net increments amounted to about three times as much as net rents during the average year.

Rents and increments yielded an average annual rate of return on current real-estate valuations of over 9 per cent. When computed so as to allow for variations in the general wholesale prices, these accruals were at an average rate of about 6 per cent.

Real-estate valuations had a sharper upward trend than other factors having upward trends affecting the economic position of these owners. The trend in real-estate valuations was at an average annual compound interest rate of 8.4 per cent.

Primary net rent per $100 worth of real estate was as follows for the terminal years: Actual figures, 1896, $5.40, and 1920, $2.26.

Net increment per $100 worth of real estate was as follows: Actual figures, 1896, $4.93, and 1920, $7.83.

Interest on $100 borrowed on first farm-mortgage security was as follows: Actual figures, 1896, $9.30, and 1920, $6.80.

Computing valuations for this real estate on the basis of rents and interest rates, the highest resulting figures for any of the 25 years, as compared with a top market valuation of $110, was about $63 when computations are based on primary net rent, and when based on secondary net rents $57. On the basis of secondary net rents, the computed valuation is from $3 to $10 less than when computed on primary net rents. In the two or three years preceding and including 1920 the market valuation was from two to three times higher than the computed valuation. Excess valuation in relation to current net returns to landlords was evidently a factor in the real-estate market in the later years.

The declining yield of wheat, the major crop, was offset by a more than proportional rise in the price of wheat. Selected costs declined when considered as a whole. Some of the decline being traced to reduced relative spreads in price between local and distant markets.

Trends in yields, costs, and prices combined so as to change the economic position of the owners to a degree beyond the efforts of operators or owners to bring about or counteract.

The annual variations of primary net rents appear to have been in negligible correlation with factors that were not components of the rents paid under the contract used. Correlation between rent and these constituent factors was higher in the case of price than in the case of yield. Correlation with selected costs was not marked. Annual variations of primary net rents were thus by no means systematically compensated by variations in costs and in nonconstituent factors, and variations in yield were not offset by current changes of cost or prices of products.

The hazards of irregularity were apparently greater in later years for a number of the factors, including rents, increments, and crop values.

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